UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

WW-16J

30 SEP 2004

Martha Clark Mettler
IDEM
100 N. Senate Ave.
P.O. Box 6015
Indianapolis, IN 46206

Dear Ms. Clark Mettler:

The United States Environmental Protection Agency (U.S. EPA) has reviewed the final Total Maximum Daily Load (TMDLs) for the Lake Michigan Shoreline in Indiana, including supporting documentation and follow up information. The TMDLs of the Indiana Department of Environmental Management (IDEM) address the E. coli impairment of recreational use in Lake, Porter, and Laporte Counties. Based on this review, U.S. EPA has determined that IDEM's TMDLs for E. coli meet the requirements of Section 303(d) of the Clean Water Act (CWA) and U.S. EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, U.S. EPA hereby approves four TMDLs for the Lake Michigan Shoreline in Indiana. The statutory and regulatory requirement and U.S. EPA's review of Indiana's compliance with each requirement are described in the enclosed decision document.

We wish to acknowledge Indiana's effort in this submitted TMDL, and look forward to future TMDL submissions by the State of Indiana. If you have any questions, please contact Mr. Kevin Pierard, Chief of the Watersheds and Wetlands Branch, at 312-886-4448.

Sincerely yours,

for Jo Lynn Traub
Director, Water Division

Enclosure

TMDL: Lake Michigan Shoreline TMDL, Indiana
Date: 30 SEP 2004

DECISION DOCUMENT FOR THE APPROVAL OF THE LAKE MICHIGAN SHORELINE TMDL, INDIANA

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

1. Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (see section 2 below).

The TMDL submittal should include an identification of the point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the National Pollutant Discharge Elimination System (NPDES) permits within the waterbody. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation.

The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as:

(1) the spatial extent of the watershed in which the impaired waterbody is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested,

agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) an explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments; chlorophyl *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comment:

Location Description: Sections 1 and 2 of the TMDL submittal describe the area of the watershed. The Lake Michigan Shoreline has a total length of 1,638 miles, with 45 miles of shoreline located within the state of Indiana. The watershed associated with the shoreline is part of the Little Calumet-Galien U. S. Geological Survey (USGS) unit HUC 4040001 and covers 536 square miles, encompassing northern portions of Lake, Porter, and LaPorte counties, Indiana. The watershed lies in the Calumet Lacustrine Plain, characterized by relatively high relief shaped by glacial activity 10,000 years ago. The area is designated Indiana Dunes National Lakeshore in 1966. The National Lakeshore contains 12,812 acres of beaches, sand dunes, bog, wetlands, and woodland forests. Approximately 500,000 people live on the Indiana portion of the Lake Michigan Shoreline, and Gary is the main population center. Waves and currents of the lake are primarily generated by winds from the northwest, north, and northeast. Table 1 below is from the IDEM TMDL submittal:

Table 1. Listing information for Lake Michigan from the Indiana 2002 section 303(d) list.

Waterbody	Segment ID	Parameters of Concern
Lake Michigan Shoreline East of Indiana Harbor Canal	INC0121G_G1074	*E. coli*
Lake Michigan Shoreline West of Indiana Harbor Canal	INC0121G_G1075	*E. coli*
Lake Michigan Shoreline-Dunes	INC0181G_G1093	*E. coli*
Lake Michigan Shoreline-LaPorte	INC0191G_G1092	*E. coli*

Land use: Row crop agriculture is the most common land use in the watershed at approximately 22%, followed by deciduous forest at 18%, pasture at 12%, and commercial/industrial at 8%. Table 3 in Section 2.3 of the TMDL submittal lists all of the land uses and percentages.

Problem Identification/Pollutant of Concern: E. coli affects the shoreline in this area of Indiana and impairs it for swimmable designated use. The shoreline is listed on the Indiana 2002 Section 303(d) list for violations of the *E. coli* water quality standards, the 4 segments are shown above.

Source identification: E. coli enters the lake from direct discharge from mammals and birds, from agricultural and storm runoff of animal waste, and from sewage. The *tributaries* to these lakeshore segments are a major contributor of *E. coli* from both point and nonpoint sources. However, according to IDEM, studies have found that direct discharge of storm water from Phase II communities directly into the lake is not considered a significant source of *E. coli* (Tetra Tech 2003b).[1]

Surrogate measures: E. coli is an indication of possible presence of other disease causing organisms or pathogens. *E. coli* is the pathogen indicator used to assess recreational use.

EPA finds that the TMDL document submitted by IDEM satisfies all requirements concerning this first element.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Comment:

Section 3.1 of the TMDL submittal discusses uses, standards, and the antidegradation policy for Indiana.

Designated Uses: All waterbodies have a designated recreational use.

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[1] Tetra Tech. 2003b. *Lake Michigan Shoreline, TMDL for E. coli Bacteria. Sources Report.* May 31, 2003. Submitted by Tetra Tech, Inc., Cleveland, Ohio.

Standards: "Recreational season is defined as April through October. *E. coli* bacteria, using membrane filter (MF) count, shall not exceed one hundred twenty five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period nor exceed two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period." [Source: Indiana Administrative Code Title 327 Water Pollution Control Board. Article 2. Section 1-6(a) Last updated November 1, 2003.]

Antidegradation: This policy established the criteria under which the state may allow new or increased discharges of pollutants, and requires those seeking to discharge additional pollutants to demonstrate an important social or economic need. This policy only applies to surface water within the Great Lakes system under the Great Lakes Initiative. (In 1995, EPA and the Great Lakes states agreed to a comprehensive plan to restore the health of the Great Lakes. The Final Water Quality Guidance for the Great Lakes System, also known as the Great Lakes Initiative, includes criteria for states to use when setting water quality standards for 29 pollutants, including bioaccumulative chemicals of concern, and prohibits the use of mixing zones for these toxic chemicals.)

Target: The standard is the target.

EPA finds that the TMDL document submitted by IDEM satisfies all requirements concerning this second element.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account *critical conditions* for steam flow, loading, and water quality parameters as part of the analysis of loading capacity. (40 C.F.R. §130.7(c)(1)). TMDLs

should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

Comment:

Loading Capacity: The loading capacity is equivalent to the TMDL found in the fifth column of Table 8 in Section 6.4 of the TMDL submittal and on the following page for ease of reference.

Method for cause and effect relationship: The model chosen for the development of this TMDL is the Environmental Fluid Dynamics Code (EFDC). This model is listed in the *Compendium of Tools for Watershed Assessment and TMDL Development* (USEPA 1997)[2]. EFDC is generally based on four principles: (1) conservation of momentum, (2) conservation of mass and energy, (3) thermodynamics, and (4) ecological interactions and processes. The model was fine-tuned for the site-specific characteristics for this TMDL development and takes into account:

- pathogen sources of streams, wildlife, waterfowl, failing septic systems, and boaters;
- storm loads due to rainfall intensity and runoff volume;
- different transport and loading mechanisms (storm events versus continual loading);
- horizontal transport and dispersion due to hydraulic, wind induced, and diffusive mechanisms; and,
- decay of *E. coli* due to sunlight as first-order decay term.

EFDC was chosen because the characteristics of this model are well-suited for both streams and lakes. This TMDL development includes river systems or tributaries that flow into Lake Michigan and the shoreline. Different hydrodynamic effects occur at the interface between the tributaries and the lake, and within the lake, that do not occur when using a model that focuses only on stream flow hydrodynamics. In addition to the stream flow, lake considerations for the model include density and topographically induced circulation, tidal and wind-driven flows, and spatial and temporal distributions of salinity, temperature, and sediment concentration.

Critical Conditions: There was no critical condition discussion in the draft TMDL submittal by IDEM, and they later responded in their response to comments. The critical condition may vary by location. Some *E. coli* counts are higher in spring and early summer, possibly due to wet weather events. At other locations, high counts may occur in late summer from an increase in *E. coli* load from the increased activity of gulls, restroom facility use, and swimmers. Allocations are for the entire summer recreation season for the entire shoreline so all conditions have been addressed in the calculations.

EPA finds that the TMDL document submitted by IDEM satisfies all requirements concerning this third element.

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[2] USEPA. 1997. *Compendium of Tools for Watershed Assessment and TMDL Development.* EPA841-B-97-006. U. S. Environmental Protection Agency. Office of Wetlands, Oceans, and Watersheds, Washington, D.C.

Table 8. Allocations for the Lake Michigan *E. coli* TMDL.

Source	Baseline Load (counts/rec season)	LA (counts/rec season)	MOS (counts/rec season)	TMDL = WLA + LA + MOS (counts/rec season)	Percent Reduction
Tributary Loads					
Indiana Harbor Ship Canal	7.66E+13	5.96E+13	3.13E+12	6.27E+13	18.1%
Burns Ditch	7.59E+14	1.65E+14	8.71E+12	1.74E+14	77.1%
Dunes Creek	1.15E+14	1.16E+13	6.08E+11	1.22E+13	89.4%
Derby Ditch	6.19E+13	5.59E+12	2.94E+11	5.88E+12	90.5%
Kintzele Ditch	6.33E+13	1.34E+13	7.05E+11	1.41E+13	77.7%
Trail Creek	2.38E+14	4.23E+13	2.23E+12	4.45E+13	81.3%
White Creek	1.45E+13	1.37E+13	7.23E+11	1.45E+13	0.0%
Residential Septic Systems					
Beverly Shores	1.05E+12	1.05E+12	0.00E+00	1.05E+12	0.0%
Burns Harbor	7.88E+11	7.88E+11	0.00E+00	7.88E+11	0.0%
Dune Acres	2.63E+11	2.63E+11	0.00E+00	2.63E+11	0.0%
East Chicago	1.31E+11	1.31E+11	0.00E+00	1.31E+11	0.0%
Long Beach	1.94E+13	1.94E+13	0.00E+00	1.94E+13	0.0%
Michiana Shores	7.49E+12	7.49E+12	0.00E+00	7.49E+12	0.0%
Michigan City	1.31E+11	1.31E+11	0.00E+00	1.31E+11	0.0%
Ogden Dunes	4.94E+13	4.94E+13	0.00E+00	4.94E+13	0.0%
Portage	3.41E+12	3.41E+12	0.00E+00	3.41E+12	0.0%
Town of Pines	5.12E+12	5.12E+12	0.00E+00	5.12E+12	0.0%
Whiting City	2.63E+11	2.63E+11	0.00E+00	2.63E+11	0.0%
Swimmers, Beach Sands, Algae, and Restroom Facilities at Public Beaches					
Mt. Baldy Beach	2.91E+13	5.08E+12	7.39E+11	5.82E+12	80.0%
Central Beach	3.12E+13	4.02E+12	2.22E+12	6.24E+12	80.0%
West Beach	6.68E+12	6.68E+12	0.00E+00	6.68E+12	0.0%
Kemil Road Beach	5.36E+12	5.36E+12	0.00E+00	5.36E+12	0.0%
Dune Acres Beach	4.02E+12	4.02E+12	0.00E+00	4.02E+12	0.0%
California Avenue Beach	2.67E+12	2.67E+12	0.00E+00	2.67E+12	0.0%
Boating Activity					
Washington Harbor Marina	4.24E+12	0.00E+00	4.24E+12	4.24E+12	0.0%
East Chicago Marina	4.24E+12	0.00E+00	4.24E+12	4.24E+12	0.0%
Hammond Marina	4.24E+12	0.00E+00	4.24E+12	4.24E+12	0.0%
Wildlife					
Seagulls	2.48E+14	2.48E+14	0.00E+00	2.48E+14	0.0%
Raccoons	5.82E+12	5.82E+12	0.00E+00	5.82E+12	0.0%
Deer	3.15E+12	3.15E+12	0.00E+00	3.15E+12	0.0%
Total	1.76E+15	6.97E+14	1.94E+13	7.16E+14	59.4%

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

Comment:

Load Allocations are shown in Table 8 of the TMDL submittal and in Section 3 above in this decision document for the following nonpoint source categories: 1) tributaries, 2) residential septic systems, 3) swimmers, beach sands, algae and restroom facilities at public beaches, 4) boating activity, and 5) wildlife.

- These locations are listed in the first column of Table 8.
- The second column shows the existing, measured baseline load.
- The third column values are the load allocations (LA) derived from the EFDC modeled calculations.
- The fourth column is the MOS (margin of safety, to be discussed in a later section of this decision document).
- The fifth column is the final TMDL allocation, which is a sum of the LA + MOS.
- The percent reduction in the last column is the ratio of the TMDL allocations compared to the baseline loads (Column 5 / Column 2, then subtracted from1.00). This is the amount that must be reduced to get from the existing load to the target TMDL load.
  1.00 - (6.27E+13 / 7.66E+13) = .181 = 18.1% (Example: Indiana Harbor Ship Canal)

A brief summary of the allocations is that there are no reductions assigned to residential septic systems, boating activity, or wildlife. Most of the reductions are assigned to the tributary loads (except White Creek). The total contribution from each tributary is treated as a nonpoint source with a load allocation assigned. The flow from the mouth of the tributary includes both the point and nonpoint source contributions from upstream; however, these point and nonpoint sources will be specifically addressed in the TMDL which will be done for the tributaries. The remaining reduction in this TMDL are assigned to two public beaches (Mt. Baldy Beach and Central Beach) for swimmers and restroom facilities.

EPA finds that the TMDL document submitted by IDEM satisfies all requirements concerning this fourth element.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and

EPA finds that the TMDL document submitted by IDEM addresses this eighth element.

9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such a TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

Comment:

There was no monitoring chapter discussion in the draft TMDL, but *E. coli* is monitored by IDEM under the Surface Water Quality Assessment program and the Interagency *E. coli* Task Force, as described in Section 3.0 of the TMDL submittal. The Task Force has 28 water quality stations in the watershed and 24 are located on the shoreline. There are a total of 117 stations, 30 of which are shoreline stations. The monitoring records are presented in Appendix D of the TMDL submittal. Besides this ongoing monitoring, in IDEM's response to comments, IDEM added clarification: it will organize a monitoring schedule that will help determine the effectiveness of implementation.

EPA finds that the TMDL document submitted by IDEM addresses this ninth element.

10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired by nonpoint sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process. EPA is not required to and does not approve TMDL implementation plans.

Comment:

The highest priority activities for implementation as described by the IDEM in Section 10.0 of the TMDL submittal are: implementation of tributary TMDLs, reduce *E. coli* loads associated with restroom facilities, reduction from septic systems through public education and maintenance/ replacement programs, and reduction from boat pumpouts. Though Table 8 shows that there would be no reduction required for some of the above listed sources, such as septic systems, the Table shows only one scenario: if septic systems are not addressed, the magnitude of two beach reductions would be significant at 80% (Mt. Baldy and Central Beach). Other scenarios that were modeled include septic system reductions, resulting in smaller reductions necessary for the

beaches. Septic systems will be addressed in the future, but at this time the amount of reduction is not known based on this shoreline TMDL.

EPA finds that the TMDL document submitted by IDEM addresses this tenth element.

11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. §130.7(d)(2)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

Comment:

The TMDL was public noticed from June 14, 2004 to July 13, 2004. There was a stakeholder meeting on June 23, 2004 in Portage, Indiana. Copies of the draft TMDL were made available upon request and at the Internet web site:
http://www.in.gov/idem/water/planbr/wqs/tmdl/tmdldocs.html In addition, there were meetings at different stages of TMDL development for stakeholder participation held between July 18, 2002 and June 1, 2004 (total six meetings). IDEM also received written comments on the TMDL and responded to those comments.

EPA finds that the TMDL document submitted by IDEM satisfies all requirements concerning this eleventh element.

12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the waterbody, and the pollutant(s) of concern.

Comment:

EPA received the Lake Michigan Shoreline, Indiana TMDL on September 1, 2004, accompanied by a submittal letter dated August 31, 2004. In the submittal letter, IDEM stated "The TMDL accompanying this letter is the Final TMDL submission from the State of Indiana for Lake Michigan shoreline...segment IDs #INC0121G_G1074, INC0121G_G1075, INC0181G_G1093, and INC0181G_G1092. The submission includes the Final TMDL, the model for the Final TMDL, and the response to the comments received during the public comment period." The letter states that the Lake Michigan Shoreline in Indiana is impaired for Recreational Use on Indiana's 303(d) list due to *E. coli*.

EPA finds that the TMDL document submitted by IDEM satisfies all requirements concerning this twelfth element.

13. Administrative Record

While not a necessary part of the submittal to EPA, the State/Tribe should also prepare an administrative record containing documents that support the establishment of and calculations/allocations in the TMDL. Components of the record should include all materials relied upon by the State/Tribe to develop and support the calculations/allocations in the TMDL, including any data, analyses, or scientific/technical references that were used, records of correspondence with stakeholders and EPA, responses to public comments, and other supporting materials. This record is needed to facilitate public and/or EPA review of the TMDL.

Conclusion

After a full and complete review, EPA finds that the TMDL for the Lake Michigan Shoreline in Indiana satisfies all of the elements of an approvable TMDL. This approval addresses 1 pollutant for a total of 4 TMDLs in segment ID#'s INC0121G_G1074, INC0121G_G1075, INC0181G_G1092, and INC0181G_G1093 addressing the *E. coli* impairment.